

4 WHEEL DRIVE



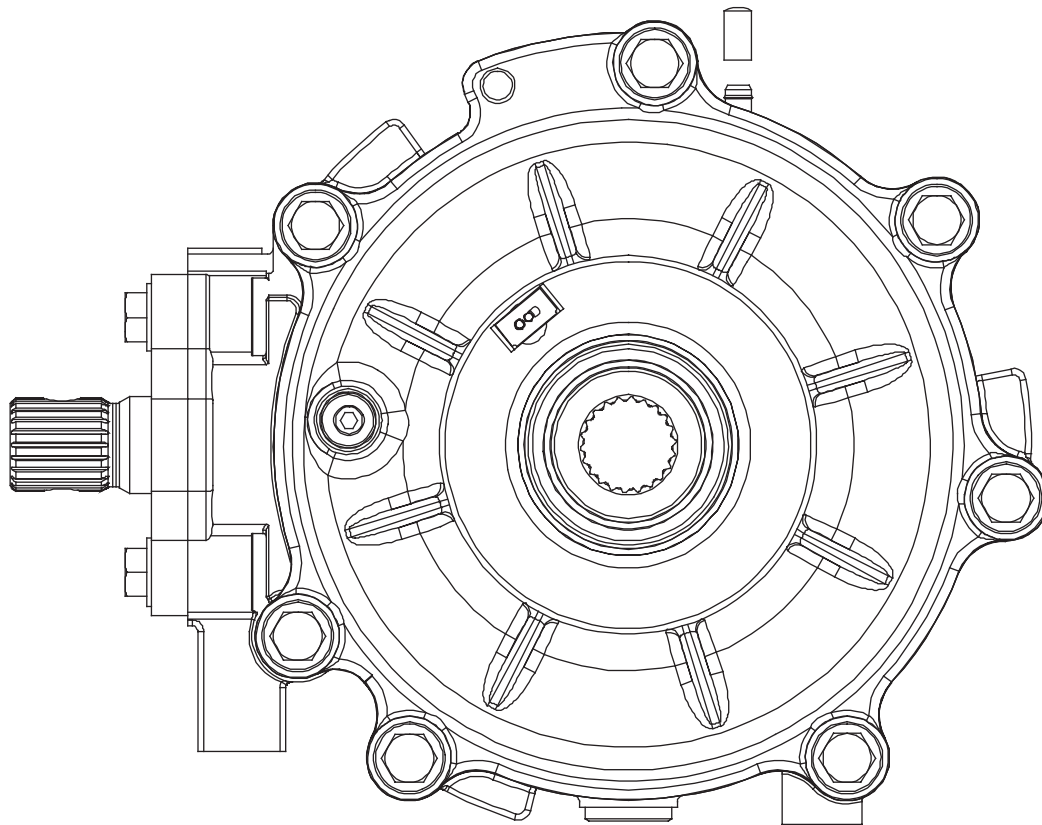
Hilliard
TM

TRANSAXLE
PARTS BREAKDOWN

Gen III Front Drive System Differential Gearcase P/N 6203-01-256

Parts and Service Manual

Rev. 0 Released 11/12/2007



Basic Operation:

The Hilliard Front Drive System (Differential) is an electro-mechanically-activated bi-directional overrunning clutch. When 12 volts of power is sent to the 4WD switch, the unit is activated to engage both front wheels instantaneously, whenever the rear wheels lose traction. The clutch also releases or overruns automatically the instant the rear wheels regain traction. Because torque is transmitted to both front wheels, it is a “true” 4WD. The over-running characteristics of this system allow for an on demand 4WD engagement and steering ease.

Specifications:

Ratio.....	3.82:1 (Input:Output)
Fluid Capacity.....	150ml. (5 oz.) Hilliard CFD Gearcase Lube
Voltage.....	12 volts (15 volts max/11 volts min)
Coil Resistance.....	24.7 ohms to 27.3 ohms (at 20°C/68°F)
Input & Output Cover Bolt Torque.....	17 ft*lbs
Mounting Bolt Torque.....	32 ft*lbs.
Oil Fill Plug Torque.....	10 ft*lbs
Oil Drain Plug Torque.....	10 ft*lbs
External Input Shaft Spline.....	22 Tooth, 24/48 Pitch, Fillet Root Side Fit, Special Class 7
Internal Output Shaft Spline.....	22 Tooth, 24/48 Pitch, Fillet Root Side Fit, Special Class 7
Mounting Feet Thread Size.....	3/8-16 UNC-2B, (4) Places x .85” Deep
Continuous Torque Rating.....	145 ft*lbs (Input)
Hilliard 4WD CFD Gearcase Oil Part Number.....	0756-01-015-T

General Maintenance:

It is recommended that the oil be changed once every 2000 miles. To change the oil, follow each step on the procedure listed below.

Oil Change Procedure

1. Remove the oil drain plug located on the bottom of the gearcase using a 5/16” hex key wrench.
2. Let all the oil drain out of the unit. Catch and discard the oil properly.
3. Be sure to clean off any debris on the drain plug and reinstall. Torque the oil drain plug to 10 ft*lbs.
4. Remove the oil fill plug using a 5/16” hex key wrench.
5. Add 150 ml. (5 oz.) of the Hilliard CFD Gearcase Lube (*note: do not use any other type of oil in this system or the 4WD will not operate properly!*)
6. Reassemble the oil fill plug into the gearcase and torque to 10 ft*lbs.

Backlash Adjustment

1. Using a 5/32” Allen wrench, turn the #10-24 socket head cap screw (located inside the hollowed out round boss protruding from the output cover) clockwise until it will not move any more (do not apply a lot of torque). At this point, you should not be able to turn the pinion gear (part #36). Do not tighten the screw.
2. Now, slowly turn the backlash cap screw counter-clockwise while turning the pinion gear at the same time. Keep slowly turning the backlash cap screw until the pinion gear can rotate (4) times (1 revolution of the ring gear) freely without any tight spots. You should only have to turn the backlash cap screw between ¼ and ½ of a turn to have the proper backlash set.

Troubleshooting:

Problem: 4WD will not engage

1. Check the minimum battery voltage going to the CFD Gearcase. The voltage should not read below 11 volts for the unit to operate properly. If the voltage is at or above 11 volts, continue on to step #2.
2. Check the resistance of the coil harness on the large output cover. This can be achieved by attaching a multi-meter to the (2) terminal pins (part #23 on the exploded view drawing located on page #5). The resistance should be 24.7 to 27.3 ohms (at 20°C/68°F). If the unit does not read any resistance, then there is a short in the coil & wire harness. The large Output Cover Sub-Assembly (P/N 6203-12-100) needs to be replaced. If the resistance in the coil is satisfactory, continue on to step # 3.
3. Check the armature plate (part #19) for a consistent wear pattern. To do this, completely drain the oil from the unit by removing the drain plug (part #32) located on the bottom of the gearcase with a 5/16" hex key wrench. Collect the oil and dispose properly. Remove the (7) hex head bolts (part #2) from the large cover using a ½" socket. Set the unit on a flat surface with the large output cover (part #27) facing up. Carefully lift the large cover straight up off of the gearcase. Remove the clutch housing/ring gear (part #12) out of the gearcase (be sure to hold the roll cage with the clutch housing/ring gear to prevent the cage from falling out). Remove the retaining ring (part #8) out of the large cover and then remove the nylatron (plastic) shim (part #40). Pick up the armature plate and wipe off any dirt or sludge. Inspect the surface that rides on the coil (part #26) located in the large output cover. There should be a consistent wear mark from the coil. Any interruptions in this wear pattern could indicate an out of flatness condition and the armature plate will need to be replaced (part #11). You can also check the flatness by setting the armature plate (tang facing up) on a flat surface or granite block and making sure the plate does not rock. If the armature plate wear is consistent and the plate is flat, continue on to step #4.
4. Check for the proper coil depth. The electro-magnetic coil (part #26) should set below the pole faces of the metal insert (steel u-shape piece pressed into the large cover assembly) located in the large output cover (part #27). To check this, simply run your fingers around the pole faces and make sure that the coil is correctly set below the metal insert along the entire circumference. If you feel the coil above the pole faces, replace the large output cover (P/N 6203-12-100). If the coil is fully below the pole faces, continue on to step #5.
5. Clean and inspect the internal clutch components. Slowly remove the roll cage (part #39) from the clutch housing/ring gear (part #12). Using a clean, dry, lint-free cloth, clean the (14) clutch rollers (part #38), the (2) race/output hubs (parts #16 & #17) and the internal profile in the clutch housing/ring gear (part #12). If there are any excessive scratches, nicks or deep flats present on any of these parts, replace with the proper service kit listed at the bottom of page 4:

Problem: 4WD will not disengage

1. Check the armature plate (part # 19) for a consistent wear pattern and flatness. To do this, completely drain the oil from the unit by removing the drain plug (part #32) located on the bottom of the gearcase with a 5/16" hex key wrench. Collect the oil and dispose properly. Remove the (7) hex head bolts (part #2) from the large cover using a ½" socket. Set the unit on a flat surface with the large output cover (part #27) facing up. Carefully lift the large cover straight up off of the gearcase. Remove the clutch housing/ring gear (part # 12) out of the gearcase (be sure to hold the roll cage with the clutch housing/ring gear to prevent the cage from falling out). Remove the retaining ring (part #8) out of the large cover and then remove the nylatron shim (part # 40). Pick up the armature plate and wipe off any dirt or sludge. Inspect the surface that rides on the coil located in the large output cover. There should be a consistent wear mark from the coil. Any interruptions in this wear pattern could indicate an out of flatness condition and the armature plate will need to be replaced (part #19). You can also check the flatness by setting the armature plate (tang facing up) on a flat surface or granite block and making sure the plate does not rock. If the armature plate wear is consistent and the plate is flat, continue on to step #2.

2. Clean and inspect the internal clutch components. Slowly remove the roll cage (part # 39) from the clutch housing/ring gear (part #12). Using a clean, dry, lint-free cloth, clean the (14) clutch rollers (part #38), the (2) race/output hubs (parts #16 & #17) and the internal profile in the clutch housing/ring gear (part #12). If there are any excessive scratches, nicks or deep flats present on any of these parts replace with the proper service kit listed at the bottom of this page.
3. With the roll cage out of the Clutch Housing/Ring Gear (#12) inspect the (14) H-Clip Springs (part #30) and make sure all the springs are intact and none are broken. If any of the springs are broken, replace the roll cage assembly with the proper service kit listed at the bottom of this page.

Problem: Gear set is too loud

1. Refer to the “Backlash Adjustment” section located on the bottom of page 2.

Assembly Procedure:

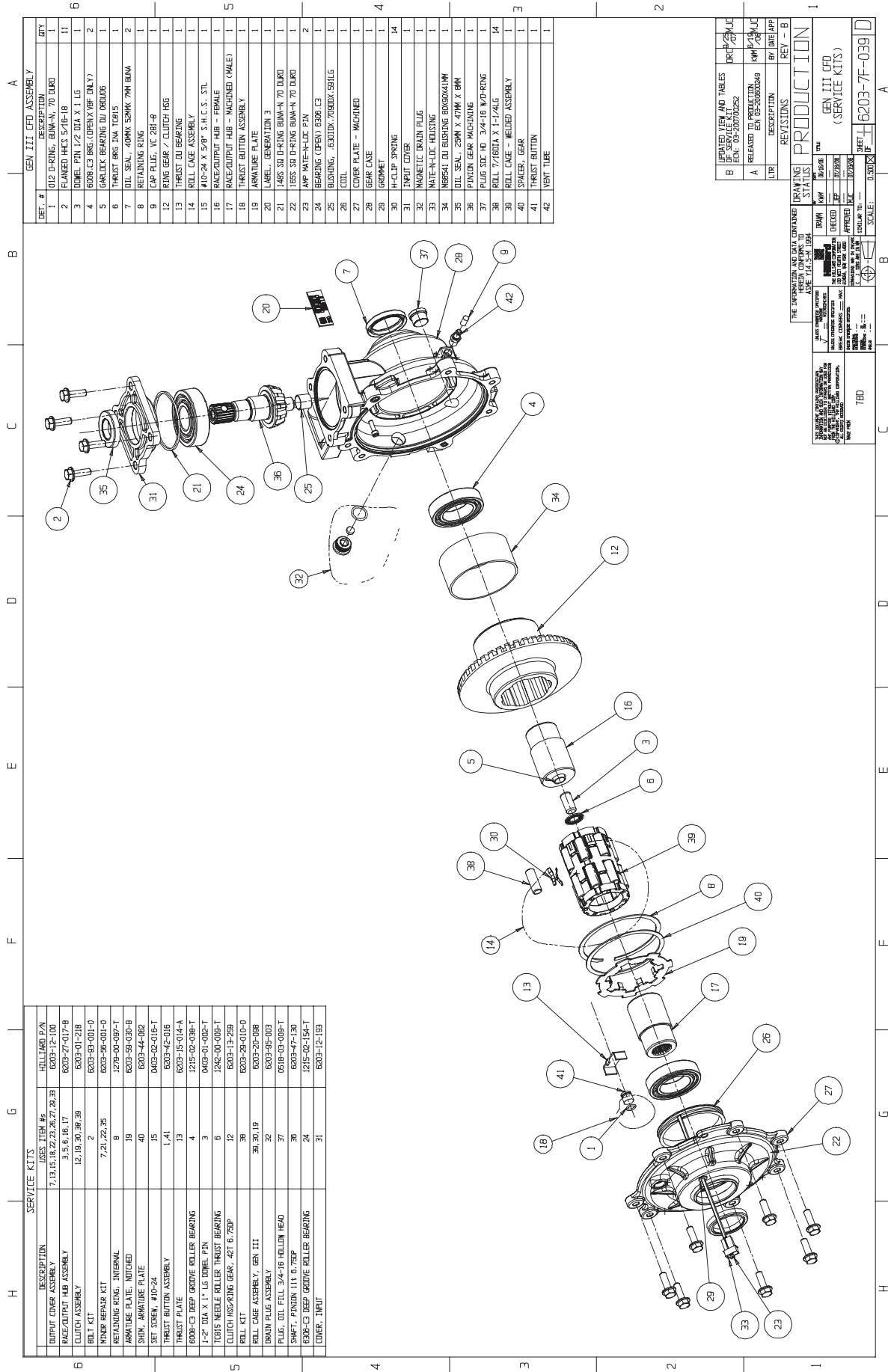
To Reassemble the Gearcase, follow the procedure listed below:

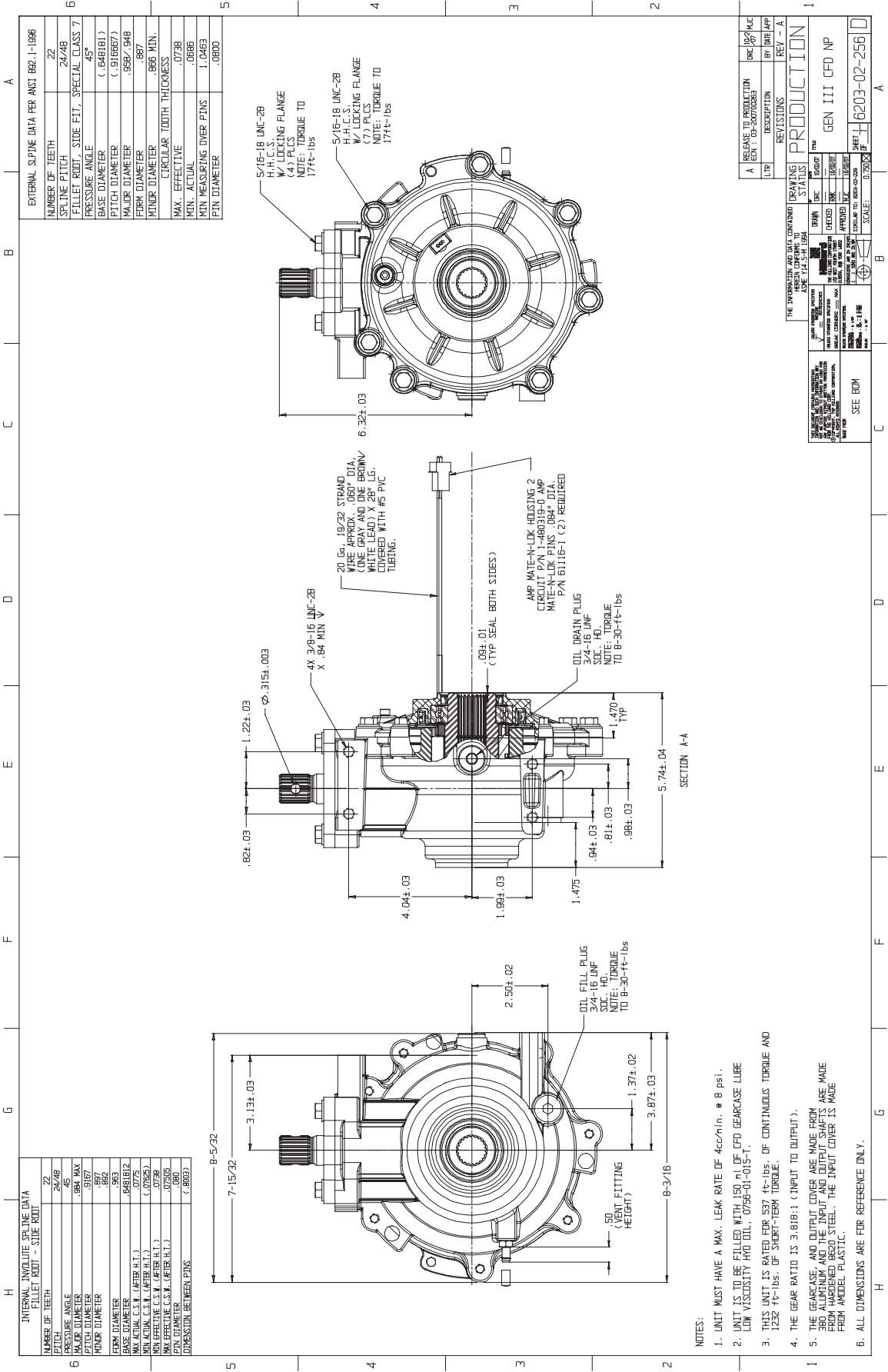
1. Be sure that all parts are clean and free of any dirt or debris and all residual oil has been removed.
2. Check the condition of the square sectioned o-ring located on the large output cover (part #7). Make sure that it is clean and free of any cuts or nicks. It is recommended that this part is replaced whenever the unit is taken apart.
3. Place the thrust button (part # 41) back into the ½” hole located on the protruding boss on large cover plate (part #27). Place the thrust plate (part #13) on top of the same boss.
4. Press the race/output hub with the ½” male dowel pin (part #17) back into the large cover (part #27).
5. Set the armature plate (part #19) back onto the coil (part #26) located in the large cover plate (part #27). The tangs of the armature plate should face out from the cover.
6. Place the nyatron (plastic) shim plate (part #40) on top of the armature plate and install the retaining ring (part #8) back into the slot located on the large cover (part #27).
7. Insert the small needle roller bearing (part #6) onto the ½” dowel on the race/output hub.
8. Reassemble the clutch housing/ring gear (Part #12), the roll cage (part #39) and the (14) rollers (part #38).
9. Insert the assembled clutch from step #8 onto the large cover plate being sure to line up and insert the tangs from the armature plate (#19) into the mating slots on the roll cage (part #39). *It is very important to make sure the tangs on the armature plate are properly aligned into the slots on the roll cage or you will damage the armature plate and the 4WD will not work!*
10. Press the race/output hub with the ½” bushing (part #16) into the gearcase (part # 28).
11. Insert the gearcase (part #28) back onto the large cover plate assembly. Be sure the boltholes are lined up and the pinion gear (part #36) and the clutch housing/ring gear (part #12) mesh properly.
12. Torque the (7) 5/16-18 UNC-2A x 1” long hex head bolts (part #2) to 17 ft*lbs.
13. Be sure to clean off any dirt or debris on the drain plug (part #32). Using a 5/16” hex key wrench, reassemble the plug into the bottom of the gearcase torque to 10 ft*lbs.
14. Remove the oil fill plug (part #37) and fill the unit with 150 ml. (5 oz.) of the Hilliard 4WD CFD Gearcase oil.
15. Reassemble the oil fill plug (part #37) into the gearcase assembly (part #28) and torque to 10 ft*lbs.
16. Follow the “Backlash Adjustment” procedure located on the bottom of page 2 and set the backlash.

Clutch Repair Kits Available for Standard Clutch Repair:

Roll Kit.....	P/N 6203-29-010-0
Race/Output Hub Assembly.....	P/N 6203-27-017-B
Clutch Housing/Ring Gear (Machined).....	P/N 6203-13-259
Clutch Assembly.....	P/N 6203-01-218
Roll Cage Assembly.....	P/N 6203-20-098

Note: A list of all available service kits and components can be found on the exploded view drawing on next page.





Hilliard Drive Train Products Approved Lubricants list

- Mobilfluid 424
- HyGuard
- Texaco Rando HD 46
- Mobilfluid LT
- Low Viscosity HyGuard
- Texaco TDH or TDH SS
- Hytran Ultra
- John Deere J20C
- Chevron 1000 THF
- Hytran
- John Deere J20D
- Shell Donax TD

**Please contact our Customer Service
Department (866-646-5278)
To special order DANA Transaxle Parts**



**SPICER OUTDOOR POWER
EQUIPMENT COMPONENTS DIVISION
DANA CORPORATION
FREDERICKTOWN, OH 43019
SERVICE PARTS REPLACEMENT LISTING
DATE ISSUED: 01/25/2005**

**MODEL NO.: 012AJ399-1
DESCRIPTION: AXLE ASSEMBLY, REAR
(FNR w/ Differential Lock) w/ Output Shaft**

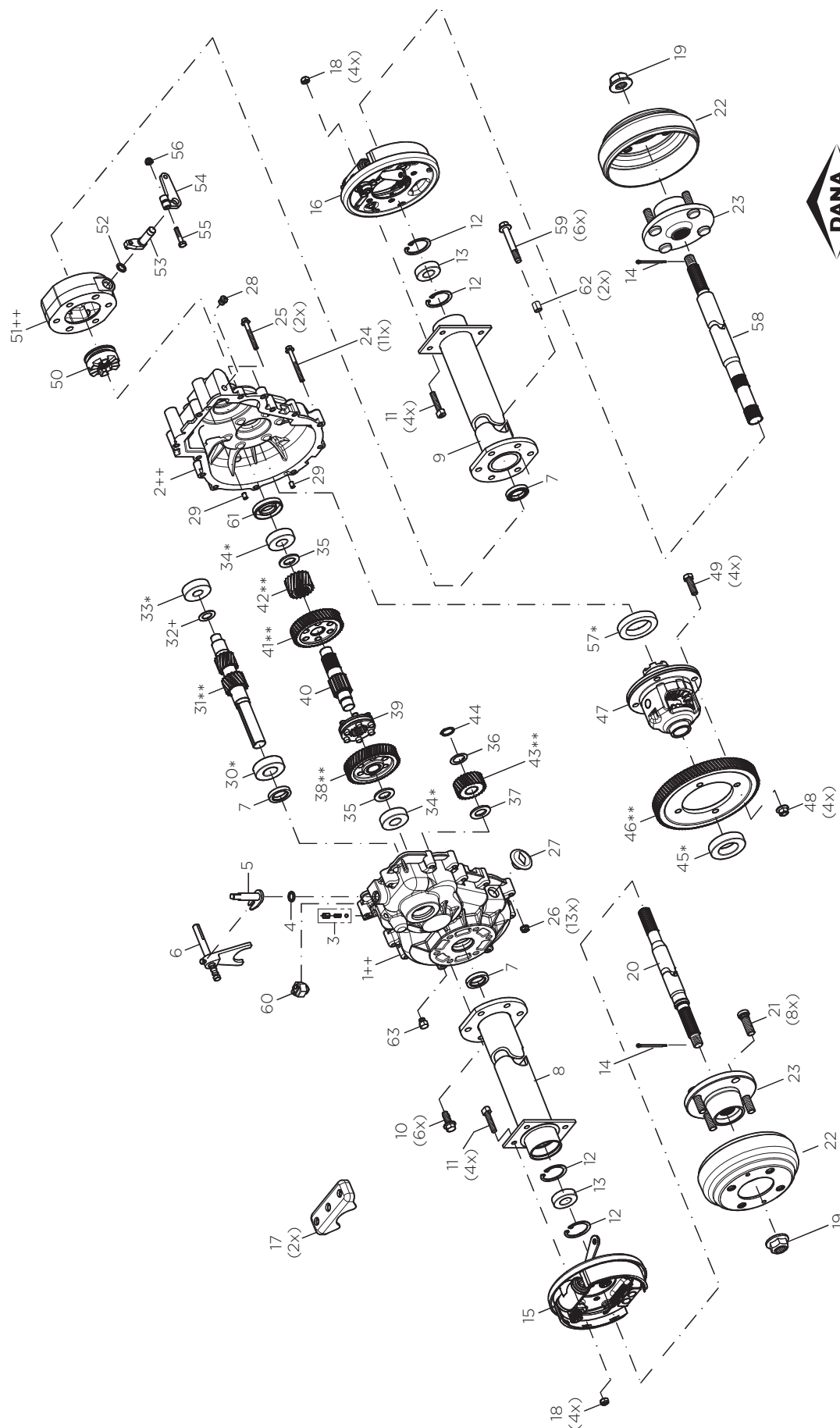
Key No.	DANA Part No.	No. Req'd	Description
1	012CH345-X	1++	Housing, Axle (w/ Idler Shaft)
2	012CH317	1++	Housing, Axle, Finished
3	012LK133	1	Kit, Detent
4	012HH122	1	Seal, Oil
5	012GV164X	1	Assembly, Actuator
6	012SV118X	1	Assembly, Shift Rod
7	012HH128	3	Seal, Oil
8	012TA381-1X	1	Assembly, Tube
9	012TA380-1X	1	Assembly, Tube
10	070HM282	6	Screw, Flange Head
11	070HM130-1	8	Screw, Socket Head
12	840293	4	Ring, Retaining
13	012HD106	2	Bearing, Ball
14	500024-6	2	Pin, Cotter
15	012WD129-X	1	Assembly, Brake
16	012WD130-X	1	Assembly, Brake
17	34617	2	Seat, Spring
18	070HN218	8	Nut, Lock
19	012HN127	2	Nut, Hex Flange
20	012SR170-1	1	Shaft, Axle
21	012HM132-1	8	Bolt, Wheel
22	012WA123	2	Drum, Brake
23	012HU137X	2	Assembly, Hub, Wheel
24	012HM110-1	11	Screw, Flange Head
25	012HM110-2	2	Screw, Flange Head
26	012HN120	13	Nut, Lock
27	41356	1	Plug, Rubber
28	012HN140	1	Vent
29	012HP120	2	Pin, Dowel
30	585965	1*	Bearing, Ball
31	012GS307	1**	Shaft, Input
32	012LK134	1+	Kit, Shim
33	012HD111	1*	Bearing, Ball
34	012HD129	2*	Bearing, Ball
35	012HS121	2	Spacer, Flat
36	012HS126	1	Washer, Thrust
37	012HS125	1	Washer, Thrust
38	012GS202X	1**	Gear Assembly, Forward
39	012GS302	1	Gear, Clutch
40	012GS337	1	Shaft, Intermediate
41	012GS204X	1**	Gear Assembly, Reverse
42	012GS215	1**	Gear, Helical (Pinion)
43	012GS207X	1**	Gear Assembly, Idler
44	012HR128	1	Ring, Retaining
45	585994	1*	Bearing, Ball
46	012GS216	1**	Gear, Helical (Ring)
47	012KD129	1	Assembly, Differential
48	012HN138	4	Nut, Lock
49	012HM129	4	Bolt, Hex
50	026HS104	1	Gear, Clutch, Diff. Lock
51	012CH319	1++	Housing, Diff. Lock
52	3112	1	Seal, Oil

- * These Ball Bearings are available packaged together as a kit. Order Dana number 012KD124 for this kit.
- ** The Internal Gears are available packaged together as a kit. Order Dana number 012KG106 for this kit.
- + Use Shim(s) as required to maintain proper clearances.
- ++ Sealant is to be applied between Left Hand and Right Hand Axle Housings. Sealant is to be applied between Right Hand Axle Housing and Diff Lock Housing. Use Loctite Gasket Eliminator No. 518 or equivalent.

Key No.	DANA Part No.	No. Req'd	Description
53	012SV117X	1	Assembly, Shift Shaft
54	314004	1	Lever, Actuating
55	4150221	1	Screw, Hex Head
56	4150223	1	Nut, Lock
57	012HD142	1*	Bearing, Ball
58	012SR171-1	1	Shaft, Axle
59	012HM137	6	Screw, Flange Head
60	5803	1	Switch
61	012HH140	1	Seal, Oil
62	026HP100	2	Bushing - Dowel
63	012HG145	1	Drain Plug

SECTION 7

parts diagrams



DANA CORPORATION
SPICER OUTDOOR POWER
EQUIPMENT COMPONENTS DIVISION

MODEL 012AJ399-1